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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/563,290	05/09/2006	Trygve Burchardt	095868-1009	4301

26371 7590 10/13/2011

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EXAMINER	
BUCHANAN, JACOB	
ART UNIT	PAPER NUMBER
1725	
MAIL DATE	DELIVERY MODE
10/13/2011	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/563,290	BURCHARDT, TRYGVE	
	Examiner	Art Unit	
	JACOB BUCHANAN	1725	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 June 2011*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *26-69* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *26-69* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 6/30/2011 has been entered.

Response to Amendment

2. This Office action addresses pending claims 26-69. Claims 26, 31, 39, 42, 45, 56, 61-69 were amended in the amendment filed 6/30/2011.

3. Further, it is noted that while this amendment has been entered, it does not comply with MPEP 714 or 37 CFR 1.121(c)(2) because claims 39 and 56 have the claim wrong claim identifiers ("Previously Presented" instead of "Currently Amended").

Claim Objections

4. Claim 46 is objected to because of the following informalities: the recitation that “calendering the current collector with the gas diffusion layer and then combining the gas diffusion layer with the current collector" is redundant. Appropriate correction is required.

For the purpose of this office action, the claim has been interpreted as reciting "calendering the current collector with the gas diffusion layer and the combining the gas diffusion layer with the active layer," as seen at least page 11 lines 15-22.

Claim Rejections - 35 USC § 103

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

6. Claims 26-27, 36, 38, 42, 45, 47-48, 54, 61-62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takuya et al. (JP 07-220734, see translation) in view of Bulan et al. (US 6,838,408).

Regarding **claim 26,** Takuya discloses a method of manufacturing a gas diffusion electrode **(see English abstract)** comprising:

- Forming an active layer by mixing a first powder mixture with PTFE particles in a dry form to produce a dry mix, adding a first organic solvent to the first dry mix to produce a first paste, and calendering *(rolling method)* the first paste to form the active layer **([0017], see "gas reaction layer sheet")**;
- Forming a gas diffusion layer by mixing a second powder mixture with PTFE particles in a dry form to produce a dry mix, adding a second organic solvent to the second dry mix to produce a second paste, and calendering the second paste to form the gas diffusion layer **([0017], see "gas diffusion layer sheet")**;

- Pressing the active layer with the gas diffusion layer and a current collector *(metal thin film 2)* to form a gas diffusion electrode **([0018])**

The reference does not explicitly disclose the method wherein the active layer and gas diffusion layer are formed by agglomerating the powder mixture and the first powder mixture prior to said agglomerating comprises carbon and a catalyst.

Bulan teaches a method for producing a gas diffusion electrode **(abstract)** wherein a powder mixture comprising a catalyst, carbon, and a binder (PTFE), to be used for the gas diffusion electrode, is milled, such as a high-speed mill with beater knives **(C4/L1-23)**. Thus, as Bulan teaches mixing in a high-speed mill, Bulan teaches agglomerating the powders.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the agglomerating of the catalyst, carbon, and powder binder in Bulan with the method of Takuya for the purpose of creating a thoroughly mixed powder mixture comprising a catalytic component for the fuel cell reaction.

Regarding **claim 45,** Takuya discloses a method of producing manufacturing a gas diffusion electrode **(see English abstract)** comprising:

- Forming an active layer and a separate gas diffusion layer using separate processes that each comprise mixing a powder mixture with PTFE particles in a dry form to produce a dry mix, adding a organic solvent to the dry mix to produce a paste, and calendering *(rolling method)* the first paste to form the active layer **([0017], see "reaction layer" and "gaseous diffusion layer")**;

- Combining the active layer with the gas diffusion layer with a current collector *(metal thin film 2)* to form a gas diffusion electrode **([0018])**

The reference does not explicitly disclose the method wherein the active layer and the gas diffusion layer are formed by agglomerating the powder mixture wherein the first powder mixture prior to said agglomerating comprises carbon and a catalyst.

Bulan teaches a method for producing a gas diffusion electrode **(abstract)** wherein a powder mixture comprising a catalyst, carbon, and a binder (PTFE), to be used for the gas diffusion electrode, is milled, such as a high-speed mill with beater knives **(C4/L1-23)**. Thus, as Bulan teaches mixing in a high-speed mill, Bulan teaches agglomerating the powders.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the agglomerating of the catalyst, carbon, and powder binder in Bulan with the method of Takuya for the purpose of creating a thoroughly mixed powder mixture comprising a catalytic component for the fuel cell reaction.

Regarding **claim 61,** Takuya discloses a method of forming a gas diffusion electrode **(see English abstract)** comprising a gas diffusion layer and an active layer **([0017])**, the gas diffusion layer and the active layer each formed from a paste created from a mixture of a powder mixture and PTFE particles and being manufacture in separate processes that each comprise:

- Mixing a powder mixture with PTFE particles in a dry from to produce a dry mix **([0017])**
- Adding an organic solvent to the dry mix to produce a paste **([0017])**

- And calendering the paste **([0017])**.

The reference does not explicitly disclose the method wherein the active layer and the gas diffusion layer are formed by agglomerating wherein the first powder mixture prior to said agglomerating comprises carbon and a catalyst.

Bulan teaches a method for producing a gas diffusion electrode **(abstract)** wherein a powder mixture comprising a catalyst, carbon, and a binder (PTFE), to be used for the gas diffusion electrode, is milled, such as a high-speed mill with beater knives **(C4/L1-23)**. Thus, as Bulan teaches mixing in a high-speed mill, Bulan teaches agglomerating the powders.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the agglomerating of the catalyst, carbon, and powder binder in Bulan with the method of Takuya for the purpose of creating a thoroughly mixed powder mixture comprising a catalytic component for the fuel cell reaction.

Regarding **claims 27 and 48,** modified Takuya discloses all of the claim limitations as set forth above. Takuya additionally discloses the method wherein the steps of forming an active layer and forming a gas diffusion layer are performed in parallel prior to the step of pressing the active layer with the gas diffusion layer **([0017])**.

To clarify, Takuya discloses preparing a reaction layer and a gaseous diffusion layer and then these layers are laminated together. Therefore, Takuya appears to disclose forming the active layer and the gas diffusion layer in parallel.

Regarding **claims 36 and 54**, modified Takuya discloses all of the claim limitations as set forth above. Takuya additionally discloses the method wherein said

adding a first organic solvent comprises stirring the first dry agglomerate during the addition of the organic solvent **([0017], see "then solvent naphtha was mixed")**.

Regarding **claims 38, 47, and 62**, modified Takuya discloses all of the claim limitations as set forth above. Takuya additionally discloses the method wherein said pressing the active layer and the gas diffusion layer and a current collector comprises calendering the current collector **(see metal plate 1)** with the active layer and the gas diffusion layer **([0018])**.

Regarding **claim 42**, modified Takuya discloses all of the claim limitations as set forth above. Takuya additionally discloses the method further comprising adding PTFE particles having particle sizes less than 1 mm to the first powder mixture before said agglomerating **([0017])**.

7. Claims 29, 39, 46, 50, 56, and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takuya et al. (JP 07-220734, see translation) in view of Bulan et al. (US 6,838,408), as applied to claims 26, 45, and 61 above, and further in view of Kato (US 6,054,230).

Regarding **claims 29, 50 and 64**, modified Takuya discloses all of the claim limitations as set forth above. While Takuya discloses the method to manufacture a gas diffusion electrode, the reference does not explicitly disclose the method further comprising extruding the first paste and second paste prior to calendering *(rolling)*.

Kato disclose a method to make an electrode consisting of graphite particles (95 wt%) and PTFE resin particles (5 wt%) by conventional paste-forming methods in which

the particulate materials were mixed together, lubricated, ram-extruded to form a tape, and calendered to form an electrode sheet **(C9/L4-7).**

Kato and Takuya are analogous because they are both concerned with the same field of endeavor, the making of an electrode.

It would have been obvious to one of ordinary skill in the art at the time of invention to combine the ram-extruded process to form a tape prior to calendering, as taught by Kato, with the method of making a gas diffusion electrode, as taught by Takuya, for the purpose shaping the dough so the calendering process can be performed more easily because the dough has been more effectively distributed.

Regarding **claims 39 and 56**, modified Takuya discloses all of the claim limitations as set forth above. While Takuya discloses the method to manufacture a gas diffusion electrode, the reference does not explicitly disclose the method wherein the catalyst comprises platinum.

Kato discloses a method to make a electrode for a fuel cell comprising platinum-supporting carbon particles **(C5/L5-35)**.

Kato and Takuya are analogous because they are both concerned with the same field of endeavor, the making of an electrode for a fuel cell.

It would have been obvious to one of ordinary skill in the art at the time of invention to combine the platinum catalyst of Kato with the catalyst of modified Takuya for the purpose of providing a catalyst capable of performing the fuel cell reaction.

Regarding **claim 46**, modified Takuya discloses all of the claim limitations as set forth above, but the reference does not explicitly disclose the method wherein the step

of combining the active layer and the gas diffusion layer with a current collector comprises calendering the current collector with the gas diffusion layer and then combining the gas diffusion layer with the active layer.

Kato discloses a method of making a gas diffusion layer **(abstract)** wherein a gas diffusion layer not comprising catalyst layer is applied to and laminated *(calendered)* to the current collector **(C9/L49-55)**. Afterwards, a layer comprising the active layer is applied to the resulting layer **(C9/L56-C10/L4)**.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the calendering step of the gas diffusion layer and the current collector of Kato with the method of modified Takuya for the purpose of enabling a continuous manufacture of said gas diffusion electrodes.

8. Claims 28, 49, and 63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takuya et al. (JP 07-220734, see translation) in view of Bulan et al. (US 6,838,408), as applied to claims 26, 45, and 61 above, and further in view of Denton et al. (US 5,865,968).

Regarding **claims 28, 49, and 63**, modified Takuya discloses all of the claim limitations as set forth above. While Takuya discloses the method comprising the steps of forming an active layer and forming a gas diffusion layer are performed in parallel prior to the step of pressing the active layer with the gas diffusion layer **([0017])**, but the references do not explicitly disclose the method wherein the steps of forming an active layer and forming a gas diffusion layer are each performed in a continuous process.

Denton discloses the method of making a gas diffusion electrode **(abstract)** wherein the process for making the gas diffusion electrode is performed in a continuous manufacturing process **(C5/L1-15)**.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the continuous manufacturing process of Denton with the method of modified Takuya for the purpose of making a smooth steady-state process which does not require frequent interruption.

9. Claims 30-31, 51, and 65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takuya et al. (JP 07-220734, see translation) in view of Bulan et al. (US 6,838,408), as applied to claims 26, 45, and 61 above, and further in view of Takeuchi et al. (US 5,571,640).

Regarding **claims 30-31, 51, and 65**, modified Takuya discloses all of the claim limitations as set forth above. While the references disclose mixing the powder mixture and PTFE together **([0017])**, the references do not explicitly disclose the method characterized in that the agglomeration is carried out using a ball mill.

Takeuchi discloses the method of making a cathode material for an electrochemical cell **(C3/L45-50)** wherein the ground cathode material is mixed with conductive diluents and a suitable binder material **(C3/L52-55).** A ball mill or vertical ball is preferred and typical grinding time ranges from between about 10 to 15 minutes **(C4/L63-65).** It is additionally disclosed that the finely divided cathode material is

preferably mixed with carbon black and/or graphite as conductive diluents and a powder fluoro-resin such as PTFE powder as a binding material is used **(C4/L65-C5/L2).**

Takeuchi and Takuya are analogous because they are both concerned with the same field of endeavor, the manufacturing of a material for an electrochemical cell.

It would have been obvious to one of ordinary skill in the art at the time of invention to combine the ball mill for grinding, as taught by Takeuchi, with the method of mixing an agglomeration of powders, as taught by modified Takuya, for the purpose of grinding and mixing powders together.

Further regarding **claims 31 and 51,** while the references do not explicitly disclose the method characterized in that the agglomeration is carried out using a ball mill and mixing for more than 30 minutes. As the operational cost of grinding and mixing and desired particle and agglomeration size are variables that can be modified, among others, by adjusting said mixing time, with said operational cost and desired particle or agglomeration size respectively increasing and decreasing, the precise mixing time cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the mixing time in the method of modified Takuya to obtain the desired balance between the operational cost and the particle size (*In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980)), since it has been held that where the general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. (*In re Aller,* 105 USPQ 223). See MPEP 2144.

10. Claims 32, 34, and 65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takuya et al. (JP 07-220734, see translation) in view of Bulan et al. (US 6,838,408), as applied to claims 26, 45, and 61 above, in view of Li et al. (US 2003/0181561).

Regarding **claims 32, 34, and 65**, modified Takuya discloses all of the claim limitations as set forth above, but the references do not explicitly disclose in the method wherein said agglomerating comprises using a blender with blades rotating at between 1,000 and 3,000 rpm.

Li discloses a method of mixing particulate materials and PTFE with a high-speed agitator blender at high revolutions of 500-3500 rpm for 5-30 minutes **([0022])**. Said particular materials can include conductive materials and said speed can include at least 1200 rpm **([0054])**.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the high speed agitator blender of Li with the method of modified Takuya for the purpose of making an agglomeration to a desired size via blending.

11. Claims 33 and 52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takuya et al. (JP 07-220734, see translation) in view of Bulan et al. (US 6,838,408), as applied to claims 26 and 45 above, in view of Li et al. (US 2003/0181561) and Plowman et al. (US 4,581,116).

Regarding **claim 33**, modified Takuya discloses all of the claim limitations as set forth above, but the references do not explicitly disclose in the method further comprising heating the powder mixtures to a temperature between 50 and 200 degrees Celsius prior to said agglomerating.

Plowman teaches a gas diffusion composite electrode **(abstract)** to be used in a fuel cell **(C1/L1-10)**. Said gas diffusion composite electrode comprises carbon black material and PTFE **(C10/L55-65)**. Plowman additionally notes that the when the materials are in a powder form, the powders are held at a temperature of 50C prior to an agglomeration step **(C11/L13-16)**.

Plowman and Takuya are analogous because they are both concerned with the same field of endeavor, namely the manufacture of gas diffusion electrodes.

It would have been obvious to one of ordinary skill in the art at the time of invention to combine the method of maintaining the powders at a temperature of 50C prior to the step of agglomeration, as taught in Plowman, with the method of making gas diffusion electrodes of modified Takuya, for the purpose of ensuring the powder materials are dry prior to the agglomeration of subjecting a dry powder of carbon and PTFE to blending, as taught by Li, with the method of preparing a dry agglomerate comprising carbon and PTFE, as taught by Takuya, for the purpose of having an agglomeration of dry carbon and PTFE without the need to filter and oven bake an agglomeration of carbon and PTFE from a dispersion.

Regarding **claim 52**, modified Takuya discloses all of the claim limitations as set forth above, but the references do not explicitly disclose in the method wherein said

agglomerating comprises using a blender with blades rotating at between 1,000 and 3,000 rpm and further comprising heating the powder mixtures to a temperature between 50 and 200 degrees Celsius prior to said agglomerating.

Li discloses a method of mixing particulate materials and PTFE with a high-speed agitator blender at high revolutions of 500-3500 rpm for 5-30 minutes **([0022])**. Said particular materials can include conductive materials and said speed can include at least 1200 rpm **([0054])**.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the high speed agitator blender of Li with the method of modified Takuya for the purpose of making an agglomeration to a desired size via blending.

Plowman teaches a gas diffusion composite electrode **(abstract)** to be used in a fuel cell **(C1/L1-10)**. Said gas diffusion composite electrode comprises carbon black material and PTFE **(C10/L55-65)**. Plowman additionally notes that the when the materials are in a powder form, the powders are held at a temperature of 50C prior to an agglomeration step **(C11/L13-16)**.

Plowman and Takuya are analogous because they are both concerned with the same field of endeavor, namely the manufacture of gas diffusion electrodes.

It would have been obvious to one of ordinary skill in the art at the time of invention to combine the method of maintaining the powders at a temperature of 50C prior to the step of agglomeration, as taught in Plowman, with the method of making gas diffusion electrodes of modified Takuya, for the purpose of ensuring the powder

materials are dry prior to the agglomeration of subjecting a dry powder of carbon and PTFE to blending, as taught by Li, with the method of preparing a dry agglomerate comprising carbon and PTFE, as taught by Takuya, for the purpose of having an agglomeration of dry carbon and PTFE without the need to filter and oven bake an agglomeration of carbon and PTFE from a dispersion.

12. Claims 35, 53, and 65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takuya et al. (JP 07-220734, see translation) in view of Bulan et al. (US 6,838,408), as applied to claims 26, 45, and 61 above, and further in view of Santilli et al. (US 5,651,813).

Regarding **claims 35, 53, and 65**, modified Takuya discloses all of the claim limitations as set forth above, but the references do not explicitly disclose in the method characterized in that agglomeration is carried out using a high-speed mill with rotating blades which rotate at more than 10,000 rpm.

Santilli discloses a process of making ink jet inks including introducing a mixture into a mill, and milling the mixture until the pigment particle size is below 1.5 µm **(C2/L20-35)**. It is additionally disclosed that milling can take place in any suitable grinding mill including a ball mill but a high speed mill is preferred **(C3/L22-25).** The high speed mill can contain a rotating shaft with one or more impellers (blades) and it is disclosed that sufficient milling media velocity is achieved when the mill is operated at 9,000 rpm **(C3/L28-35).**

Santilli and Takuya are analogous because they are concerned with the similar problem of grinding and mixing a particle to a desired size.

It would have been obvious to one of ordinary skill in the art at the time of invention to combine the high speed mixer, as taught by Santilli, with the method to agglomerate the particles, as taught by Takuya, for the purpose of making an agglomeration to a desired size via grinding.

Furthermore regarding the claim limitation of the speed at which the high speed mill is operated (e.g. "with rotating blades which rotate at more than 10,000 rpm"), as the operational cost of grinding and mixing and desired particle and agglomeration size are variables that can be modified, among others, by adjusting said rotation speed, with said operational cost and desired particle or agglomeration size respectively increasing and decreasing, the precise rotation speed cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the rotation speed in the method of Takuya modified by Santilli to obtain the desired balance between the operational cost and the particle size (*In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980)), since it has been held that where the general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. (*In re Aller,* 105 USPQ 223). See MPEP 2144.

13. Claims 37, 55, and 66 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takuya et al. (JP 07-220734, see translation) in view of Bulan et al.

(US 6,838,408), as applied to claims 36, 54, and 61 above, and further in view of Gascoyne et al. (US 2002/0015879).

Regarding **claim 37, 55, and 66**, modified Takuya discloses all of the claim limitations as set forth above. While Takuya discloses the method to stirring the dry agglomerate during the addition of the organic solvent **([0017])**, the reference does not explicitly disclose the method further comprising heating the first dry agglomerate during said stirring.

Gascoyne discloses an improved fuel cell anode structure **([0017])** wherein the anode structure the gas diffusion layer may contain carbon powder such as graphitised carbon, and a polymer such as PTFE **([0027])**. Gascoyne continues to disclose a dispersion of carbon-based component, specifically 30 weight parts of high surface area carbon black, and a catalyst component, specifically 100 combined weight parts of platinum and ruthenium catalyst **([0051]).** To this is added 10 weight parts of PTFE as a dispersion in water and the mixture is heated and stirred to entrain the PTFE particles within the carbon catalyst materials **([0051]).**

Gascoyne and Takuya are analogous because they are both concerned with the same field of endeavor, the making of an electrode for a fuel cell.

It would have been obvious to one of ordinary skill in the art at the time of invention to combine the stirring while heating an aqueous dispersion of PTFE and carbon, as taught by Gascoyne, with the method of making a paste from an organic solvent and agglomerate, as taught by Takuya, for the purpose of entraining the PTFE particles within the carbon catalyst materials.

14. Claims 40-41, 43, 57-60, and 67-69 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takuya et al. (JP 07-220734, see translation) in view of Bulan et al. (US 6,838,408), as applied to claims 26, 45, and 61 above, and in view of Binder et al. (US 3,854,994), and further in view of Solomon (US 4,440,617).

Regarding **claims 40-41, 57, 59, and 68-69**, modified Takuya discloses all of the claim limitations as set forth above. While Takuya discloses the method to manufacture a gas diffusion electrode, the references do not explicitly disclose the method wherein the first powder mixture forming the active layer comprises 27-75 wt% graphite with platinum, and 27-75 wt% graphite, nor comprising graphite with Ag, Co, Fe, perovskites or spinells.

Binder discloses a method of making a porous electrode having an electrically conductive electrocatalytically active layer and a contiguous gas permeable hydrophobic layer comprising polytetrafluoroethylene and carbon powder and graphite fibers **(abstract).** To enhance the strength and electrical conductivity of the material, graphite fibers or commercial graphitic felt are added **(C4/L36-41).**

Binder and Takuya are analogous because they are both concerned with the same field of endeavor, the making of a gas permeable electrode.

It would have been obvious to one of ordinary skill in the art at the time of invention to combine the graphite fibers or graphite felt, as taught by Binder, with the PTFE powder, as taught by modified Takuya, for the purpose of making a gas diffusion electrode with enhanced strength and electrical conductivity.

While the references disclose a gas diffusion electrode comprising PTFE and graphite, the references do not explicitly disclose the active layer comprising graphite with platinum, nor with Ag, Co, Fe, perovskites, or spinels.

Solomon discloses a method of making a non-bleeding gas electrode comprising a high surface area electroconductive carbon and PTFE **(abstract).** For the active layer, the concentration of PTFE in the electroconductive carbon/PTFE mix ranges from about 10 to 40 weight parts of PTFE and from about 60 to 90 weight parts of high surface area carbon to make up 100 weight parts of mix upon drying **(C8/L19-23).** It is additionally disclosed that platinum can be deposited on the active layer surface **(C9/L68-C10/L2),** or other precious metal catalysts such as silver can be deposited to enhance the catalytic activity of the carbon **(C10/L16-24).**

Solomon and Takuya analogous because they are both concerned with the same field of endeavor, the making of a gas electrode.

It would have been obvious to one of ordinary skill in the art at the time of invention to combine the weight percent of the electroconductive carbon and catalyst metals including platinum and silver, as taught by Solomon, with the PTFE powder, as taught by modified Takuya, for the purpose of making a gas diffusion electrode with enhanced catalytic activity.

Regarding **claims 43, 58, 60, and 67**, modified Takuya discloses all of the claim limitations as set forth above, but the references do not explicitly disclose the gas diffusion layer comprising 55-75 wt% activated carbon or graphite and 25-45 wt% PTFE.

For the gas diffusion layer, Binder discloses a method of making a porous electrode having an electrically conductive electrocatalytically active layer and a contiguous gas permeable hydrophobic layer comprising polytetrafluoroethylene and carbon powder and graphite fibers **(abstract, C3/38-43).** To enhance the strength and electrical conductivity of the material, graphite fibers or commercial graphitic felt are added **(C4/L36-41).**

Binder and Takuya are analogous because they are both concerned with the same field of endeavor, the making of a gas permeable electrode.

It would have been obvious to one of ordinary skill in the art at the time of invention to combine the graphite fibers or graphite felt, as taught by Binder, with the PTFE powder, as taught by modified Takuya, for the purpose of making a gas diffusion layer with enhanced strength and electrical conductivity.

Regarding the limitation of the weight percent of the activated carbon or graphite and PTFE in the gas diffusion layer (e.g. “the gas diffusion layer comprising 55-75 wt% activated carbon or graphite and 25-45% wt% PTFE”). As the electroconductivity and hydrophobicity are variables that can be modified, among others, by adjusting said weight percents, with said electroconductivity and hydrophobicity increasing and decreasing respectively with an increase in the weight percent of activated carbon or graphite, the weight percent cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the weight percents of activated carbon or graphite and PTFE in the method of Takuya modified by Binder and Soloman to obtain the desired balance

between the electroconductivity and hydrophobicity (*In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980)), since it has been held that where the general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. (*In re Aller,* 105 USPQ 223). See MPEP 2144.

15. Claim 44 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takuya et al. (JP 07-220734, see translation) in view of Bulan et al. (US 6,838,408), as applied to claim 26 above, and further in view of Plowman et al. (US 4,581,116).

Regarding **claim 44**, modified Takuya discloses all of the claim limitations as set forth above. While Takuya discloses mixing the powder mixture and PTFE together **([0017])**, the references do not explicitly disclose the method further comprising drying the gas diffusion electrode at a temperature less than 40 degrees Celsius.

Plowman teaches a gas diffusion composite electrode **(abstract)** to be used in a fuel cell **(C1/L1-10)**. Plowman discloses that in the process, the lamination of the active layer, current collector, and backing layer *(gas diffusion layer)* is followed by a drying step to remove the organic solvent **(C11/L68-C12/L2)**. Therefore, as Plowman discloses that excess organic solvent may remain in the gas diffusion electrode after the calendering step, it would have been obvious to one having ordinary skill in the art at the time of invention to include a drying step after the calendering step as taught by Plowman with the manufacturing method of modified Takuya for the purpose of removing excess organic solvent.

While the references do not disclose the drying step at a temperature less than 40 degrees Celsius, the operational cost of drying or removing a solvent from a mixture and drying rate are variables that can be modified, among others, by adjusting said temperature of drying, with said operational costs and drying rate both increasing with an increase of temperature, the precise temperature cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the temperature of drying in the method of modified Takuya to obtain the desired balance between the operational cost and the drying rate (*In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980)), since it has been held that where the general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. (*In re Aller,* 105 USPQ 223). See MPEP 2144. Additionally, one of ordinary skill in the art would recognize the ability of air drying said electrode at ambient temperature.

Response to Arguments

16. Applicant's arguments with respect to claims 26, 45, and 61 have been considered but are moot in view of the new ground(s) of rejection.

17. Applicant's arguments filed 6/30/2011 have been fully considered but they are not persuasive.

Applicant argues that there is no support whatsoever for the assertion that the Takuya discloses, teaches, or even suggests forming an agglomerate merely because it discloses some form of "mixing".

This is not considered persuasive. Takuya discloses forming an active layer and a separate gas diffusion layer using separate processes that each comprise mixing a powder mixture with PTFE particles in a dry form to produce a dry mix, adding a organic solvent to the dry mix to produce a paste, and calendering *(rolling method)* the first paste to form the active layer **([0017], see "reaction layer" and "gaseous diffusion layer")**.

The reference does not explicitly disclose the method wherein the active layer and gas diffusion layer are formed by agglomerating the powder mixture and the first powder mixture prior to said agglomerating comprises carbon and a catalyst.

Bulan teaches a method for producing a gas diffusion electrode **(abstract)** wherein a powder mixture comprising a catalyst, carbon, and a binder (PTFE), to be used for the gas diffusion electrode, is milled, such as a high-speed mill with beater knives **(C4/L1-23)**. Thus, as Bulan teaches mixing in a high-speed mill, Bulan teaches agglomerating the powders.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the agglomerating of the catalyst, carbon, and powder binder in Bulan with the method of Takuya for the purpose of creating a thoroughly mixed powder mixture comprising a catalytic component for the fuel cell reaction.

Thus, Bulan is used to teach the agglomerating of the dry powder mixture.

Applicants argue that in paragraph [0017] of Takuya, the graphite, PTFE, and the solvent are all mixed together at the same time to form a paste.

This is not considered persuasive. The examiner has supplied as human translation of Takuya. From the human translation, Takuya clearly discloses mixing the powders of graphite and PTFE first, and then adding a solvent naptha to the powder. See attached human translation. Thus, Takuya teaches the graphite, the PTFE, and the solvent are not all mixed together at the same time, but the powders are mixed first and then the solvent is added to the powder mixture.

18. In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Furthermore, because Takuya teaches mixing the powders first and then adding the solvent to the powder mixture **([0017])**, and because Bulan provides a motivation for adding catalyst to the first powder mixture before said agglomeration and further teaches that mixing can be agglomerating via a high speed mill **(C4/L1-23)** *(it is noted that because Bulan teaches a method of mixing that appears to be the same as the agglomeration provided in the instant specification, Bulan discloses agglomeration of powder)*, the examiner has not used impermissible hindsight.

Conclusion

19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to JACOB BUCHANAN whose telephone number is (571)270-1186. The examiner can normally be reached on Monday - Friday 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Basia Ridley can be reached on (571)272-1453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. B./
Examiner, Art Unit 1725

/Basia Ridley/
Supervisory Patent Examiner, Art Unit 1725